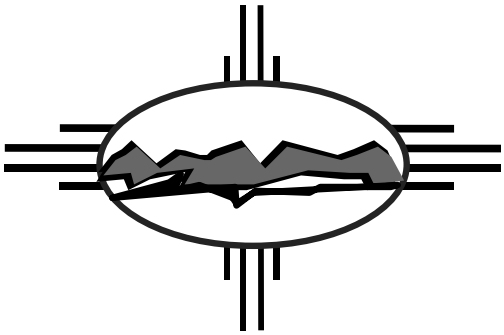
STANDARD OPERATING PROCEDURE

Title:	Identifier:	Revision:	Effective Date:
Field Surveys of Gamma Radiation Using Sodium Iodide Detectors	**ER-SOP-6.23**	**1**	**09/15/98**



ER PROJECT

APPROVALS FOR USE

Author's Name (Print):	Author's Signature:	Date:
Linnea Wahl	**Signature on file**	**7/30/98**
Quality Program Project Leader's Name (Print):	Quality Program Project Leader's Signature:	Date:
Larry Maassen	**Signature on file**	**7/30/98**

LOS ALAMOS NATIONAL LABORATORY

FIELD SURVEYS OF GAMMA RADIATION USING SODIUM IODIDE DETECTORS

Table of Contents

FIELD SURVEYS OF GAMMA RADIATION USING SODIUM IODIDE DETECTORS

NOTE: ER Project personnel may use copies of this procedure printed from the controlled document electronic file; however, it is the user's responsibility to assure that they are trained to and utilize the current version of this procedure. The procedure author may be contacted if instructions are unclear.

1.0 PURPOSE

This procedure states the responsibilities and provides instructions for conducting field surveys of gamma radiation with a sodium iodide (NaI) detector at the Los Alamos National Laboratory Environmental Restoration (ER) Project.

Note: Instructions for conducting alpha and beta radiation surveys, which are not appropriate for determining site status, are not provided in this procedure. This procedure applies to ER Project workers who conduct field radiation surveys.

2.0 TRAINING

2.1 All users of this SOP are trained by self-study, and the training is documented in accordance with QP-2.2, Personnel Orientation and Training.

2.2 The **Field Project Leader** (FPL) is responsible for ensuring the proper implementation of this procedure, and will ensure that relevant team members have completed all training assignments (see Section 7.0) in accordance with QP-2.2, Personnel Orientation and Training.

2.3 Field radiation surveys are to be conducted only by qualified radiological screening personnel (RSPs), health protection technicians (HPTs), or radiation control technicians (RCTs). Qualification is documented by an ESH-1 radiological surveillance authorization agreement, as discussed in the ER Project Health and Safety Plan (HASP) and ESH-1 procedure ESH-1-01-03, Radiological Surveillance Authorization Agreement. Training requirements include reading this procedure and completing a 1-hr, hands-on, procedure-specific training provided by an RSP, HPT, or RCT experienced in using this procedure.

3.0 DEFINITIONS

3.1 ***Operational check*** - a test to determine that an instrument is operating properly.

3.2 ***Detector*** - in this procedure, the part of the instrument that contains a sodium iodide crystal. In the Ludlum Model 44-2, Ludlum Model 44-10, and Eberline Model SPA-3, the detector is in a probe connected by a cable to a ratemeter/scaler. In the Ludlum Model 12S, Ludlum Model 19, and Bicron Microanalyst, the detector is built into the instrument.

3.3 ***Ratemeter/scaler*** - the part of the instrument that contains the electronic components.

4.0 BACKGROUND AND PRECAUTIONS

This procedure must be performed in accordance with an approved site-specific health and safety plan, the ER Project HASP, ESH-1 procedure ESH-1-01-03, and ER-HPM-1, R0, Radiological Control Requirements for the Environmental Restoration Project. Although the radiation hazards encountered during field surveys are minimal, all radiation measurements shall be performed by personnel qualified and approved in accordance with ESH-1-01-03.

This procedure is used to measure increases in gamma radiation count rates relative to background and to locate and measure sources of gamma radiation that cause count rates to change. Note that increases in gamma radiation must be carefully interpreted because uncontaminated areas can demonstrate high readings if they are next to an area contaminated with gamma-emitting radionuclides.

This procedure is used only with the radiation detection systems listed in Section 5.0. If other systems are used, the time to achieve 90% response must be determined (available from the manufacturer) and substituted for the count time required in Section 6.2.

- On Ludlum ratemeter/scalers and microR meters, the response time can be set fast or slow. In fast response mode, 90% response is achieved in 4 s. In slow response mode, the 90% response time is 22 s.
- On Eberline ratemeter/scalers, the default response mode is fast, which achieves 90% response in 1 to 10 s. If the ratemeter/scaler is changed to slow response mode, the time is 2 to 29 s.
- On Bicron microR meters, the response time can be set fast or slow. In fast response mode, 90% response is achieved in 12 s. In slow response mode, the 90% response time is 20 s.

5.0 EQUIPMENT

Equipment and supplies to be used are listed below. This procedure is specific to the instruments listed in this section. If other instruments are used, the time to achieve 90% response must be determined (available from the manufacturer) and substituted for the count time required in Section 6.2.

- Ludlum Model 44-2 or 44-10 sodium iodide detector and a portable ratemeter/scaler (all models EXEPT Model 2350-1, which has an adjustable response time)
- Ludlum Model 12S or 19 MicroR meter (which has an internal sodium iodide detector)
- Eberline Model SPA-3 sodium iodide detector and Model ESP-1 portable ratemeter/scaler
- Bicron Microanalyst MicroR meter (which has an internal sodium iodide detector)
- D-cell batteries
- Gamma check source, such as a cesium-137 gamma source disk with an activity on the order of 2,000,000 dpm (approximately 1 μCi)

6.0 PROCEDURES

Note: Field changes to SOPS are made in accordance with QP-4.2, Standard Operating Procedures Development.

6.1 Preparing for the Survey

6.1.1 Inspect the instrument for obvious damage. On Ludlum Model 44-2, Ludlum Model 44-10, and Eberline Model SPA-3 detectors, check for frayed or broken cables. If the instrument is damaged obtain another.

6.1.2 Check the battery and record the result on the daily activity log or in a field log book. If the check indicates low battery power, replace the batteries.

6.1.3 On Ludlum ratemeter/scalers, Ludlum microR meters, and Bicron microR meters, set the meter response to fast. On Eberline ratemeter/scalers, this is the default meter response.

6.1.4 Check that other ratemeter/scaler settings are appropriate. For example, on a ratemeter/scaler with an adjustable threshold and window, the threshold should be set at 100 and the window should be set open. Record the settings on the daily activity log or in a field log book.

6.1.5 Check the calibration sticker and record the date on the daily activity log or in a field log book. If the calibration due date has passed, obtain another calibrated instrument.

6.1.6 Check the operation of the detector by placing the detector over a gamma check source and ensuring that the detector responds. Note where the detector and check source are placed, relative to each other, each time. Record the results on the daily activity log or in a field log book. Ensure that the results are within 20% of the previous day's operational check result (see subsection 6.3.2).

6.2 Conducting the Survey

6.2.1 Turn the instrument on and turn up the audible response.

6.2.2 Walk slowly over the survey area holding the detector approximately 3 ft above the ground (at waist level). Listen for increases in audible response (headphones are recommended) and look for needle deflection. Although both indicate an increase in radiation levels, the audible response is more sensitive than needle deflection. If an increase in audible response of two to three times greater than background is noted, vary the height and direction of the detector to determine the maximum radiation level. Hold the detector at that point for at least 15 s to obtain an accurate count rate.

6.2.3 To obtain a contact reading of an object or surface, place the detector directly on the object or surface and hold it there for at least 15 s to obtain an accurate count rate. If the object or surface is known or suspected to have loose contamination, exercise good radiation safety practices, and do not allow the detector to contact the object or surface.

6.2.4 Give particular attention to drain lines, pipes, ducts, pits, sumps, or any other places where radionuclides could concentrate.

6.2.5 Record all count rates (from subsections 6.2.2 and 6.2.3) and observations (from subsection 6.2.4) on the daily activity log or field log book.

6.2.6 If necessary, ensure that all survey locations are properly staked and locations are identified on the stakes.

6.2.7 At the end of field activities, ensure that all equipment is accounted for, decontaminated, and ready for shipment.

6.3 Quality Assurance/Quality Control

6.3.1 Before surveying each day, check the operation of the instrument as described in “Preparing for the Survey,” subsection 6.1.6. Be careful to place the detector and check source in the same place, relative to each other, each time.

6.3.2 If the result of the operational check varies more than 20% from the previous day’s result, stop using the instrument and inform the equipment manager that there may be a problem with the instrument. Obtain another instrument and repeat this procedure.

7.0 REFERENCES

- ESH-1-01-03, Radiological Surveillance Authorization Agreement
- QP-2.1, Documentation of Personnel
- QP-2.2, Personnel Orientation and Training
- QP-4.3, Records Management
- LANL-ER-HPM-1, Radiological Control Requirements for the Environmental Restoration Project
- LANL-ER-SOP-1.04, Sample Control and Field Documentation
- LANL ER Project Health and Safety Plan, Rev. 0, March 24, 1995
- USNRC NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination, June 1992

8.0 RECORDS

The **Field Team Leader** submits the following records to the Records Processing Facility in accordance with QP-4.3, Records Management.

8.1 Field Log Book

8.2 Daily Activity Log

8.3 Training Documentation

9.0 ATTACHMENTS

None